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The control strategy analyses is summarized in a table for each region. The "Additional Controls" used in the strategy consisted only of the Proposed Kansas Regulations, a summary of which is appended. Missouri does not propose emission standards for these pollutants, thus no "Additional Controls" were put on the Missouri Portion. A third strategy was used which imposed a 90% reduction on process sources in Missouri. "Calculations for Control Strategy 3", "Methodology for Calculation of Emissions Required to Meet the Federal Air Quality Standards" and "Calculations for Control Strategies 1 and 2" are also appended.

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# FINAL REPORT
# CONTROL STRATEGIES FOR
# SET II POLLUTANTS
# KANSAS CITY IAQCR
# AND
# S. CENTRAL KANSAS AQCR

Prepared For

The Environmental Protection Agency
Durham, North Carolina 27701

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Prepared by
Donald J. Henz, P.E.
December 28, 1971

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Appendix 1 - Summary of Provisions of Proposed Amendments to Kansas Air Pollution Control Regulations (July 1971)

Appendix 2 - Calculations for Control Strategy 3

Appendix 3 - Methodology for Calculation of Emissions Required to Meet The Federal Air Quality Standards

Appendix 4 - Calculations for Control Strategies 1 and 2

## SUMMARY

Strategies for Set II pollutants were run for the South Central Kansas AQCR and the Kansas City Interstate AQCR. The Summary Tables are included herein (Tables 1 and 2). The "Additional Controls" used in the strategy consisted of the Proposed Kansas Regulations (summarized in Appendix 1) only. Missouri does not propose emission standards for ~~Set II~~ pollutants, Thus no "Additional Controls" were put on the Missouri Portion of the KCIAQCR. In short, the strategies used to compile the Summary Tables are as follows:

### KANSAS CITY IAQCR

| | |
|---|---|
| Strategy 1 | Kansas and Missouri-Federal Motor Vehicle Standard only |
| Strategy 2 | Missouri-Federal Motor Vehicle Standard only |
| | Kansas-Federal Motor Vehicle Standard and proposed Kansas regulations |

### SOUTH CENTRAL AQCR

| | |
|---|---|
| Strategy 1 | Federal Motor Vehicle Standard only |
| Strategy 2 | Federal Motor Vehicle Standard and proposed Kansas regulations |

As the Summary Tables show, both regions will meet the Federal Ambient Air Quality Standards by 1975 under

Strategy 1 with the exception of carbon monoxide in the KCIAQCR. Even under Strategy 2, the standard will not be met in that region.

A third strategy was used which imposed a 90% reduction on process sources in Missouri. While that approach reduced 1975 emissions by 7.7 tons per year, it is not significant in the overall picture. The resultant overall reduction is 33% which is very close to the 1975 reduction using Strategy 2. The calculations for Strategy 3 are attached (Appendix 2).

The methodology used in calculating the emissions required to meet the Federal Ambient Air Quality Standards is attached (Appendix 3).

The calculations for Strategies 1 and 2 are attached (Appendix 4) and the rational for determining control rates, growth rates and the motor vehicle emission rates, all of which are used in the calculations, are in the body of this report.

In general, the Federal Air Quality Standards will be met in both regions by 1975 without the imposition of controls on stationary sources. The Kansas City AQCR will not meet the carbon monoxide standard until sometime in 1976, with or without controls on stationary sources, and therefore it will be necessary to seek a two-year extension under Sec. 51.30 of EPA's regulations, (36 FR 22405).

TABLE 1

SUMMARY OF CONTROL STRATEGY ANALYSIS

S. CENTRAL (WICHITA) AIR QUALITY CONTROL REGION

| | Air Quality Standard $\mu g/m^3$ | Existing Measured Concentration $\mu g/m^3$ | Existing Emissions | Emissions Required to Achieve Standards | Emissions After Application of Federal Motor Vehicle Program | | Emissions After Application of Any Additional Control Measures | |
|---|---|---|---|---|---|---|---|---|
| | | | | | 1975 | 1977 | 1975 | 1977 |
| CO[a] | 40, 1 Hr, 10, 8 Hr. | 5.1[b] | 280,400 | - | 188,000 | 138,000 | 188,000 | 138,000 |
| Oxidants | 160 | 190[c] | 71,300[e] | 59,900 | 48,500 | 40,700 | 42,700 | 37,800 |
| $NO_x$ | 100 | 99[d] | 75,300 | - | 74,600 | 67,900 | 73,000 | 67,100 |

a) Concentration in $mg/m^3$
b) Second highest 8 hr. average
c) Second highest 1 hr. average; highest 1 hr. average = 210 $\mu g/m^3$
d) Annual arithmetic mean (NASN data from 7-70 to 7-71)
e) Hydrocarbons

TABLE 2

SUMMARY OF CONTROL STRATEGY ANALYSIS

KANSAS CITY AIR QUALITY CONTROL REGION

| | Air Quality Standard $\mu g/m^3$ | Existing Measured Concentration $\mu g/m^3$ | Existing Emissions | Emissions Required to Achieve Standards | Emissions After Application of Federal Motor Vehicle Program | | Emissions After Application of Any Additional Control Measures | |
|---|---|---|---|---|---|---|---|---|
| | | | | | 1975 | 1977 | 1975 | 1977 |
| CO[a] | 40, 1 Hr.<br>10, 8 Hr. | 16.6 [a,c] | 689,200 | 414,000 | 475,000 | 344,000 | 475,000 | 344,000 |
| Oxidants | 160 | 168[d] | 186,400[f] | 181,000 | 142,000 | 127,000 | 136,000 | 121,000 |
| $NO_x$ | 100 | 57[e] | 306,400 | - | 346,000 | 349,000 | 346,000 | 346,000 |

a) Concentration in $mg/m^3$

b) Based on 8 hr. value

c) Second highest 8 hr. average same as highest 8 hr. average

d) Second highest 1 hr. average; highest 1 hr. average = 200 $\mu g/m^3$

e) Annual arithmetic mean (NASN data from 7-70 to 7-71)

f) Hydrocarbons

## EMISSIONS DATA

S. Central AQCR

The emission data on which the strategies are based were obtained from the Kansas Statewide Inventory[a] and represent emissions for the base year 1970.

Kansas City IAQCR

The emission data on which the strategies are based were obtained from Appendix D[b] and represent emissions for the base year 1970.

---

(a) Statewide Inventory for Air Pollution Emissions, State of Kansas, 1970, Final Report. PEDCo Environmental Specialists Inc. Cincinnati, Ohio. December 31, 1971.

(b) Compilation of Appendix D for Kansas City Air Quality Control Region , Final Report. PEDCo Environmental Specialists Inc. Cincinnati, Ohio. December 27, 1971.

## GROWTH DATA

### General

Emissions for each AQCR were separated into basic categories. It was determined that each category will increase its uncontrolled emissions in direct proportion to some single demographic factor. This relationship is as follows:

| Category | Demographic Factor |
|---|---|
| Industrial & Commercial Fuel | Manufacturing employees |
| Power Plants | Generating Capacity |
| Process Losses | Manufacturing employees |
| Solid Waste Disposal | Population |
| Gasoline Handling | Manufacturing employees |
| Solvent Emissions | Manufacturing employees |
| Agricultural Burning | Population |

Emissions not falling into one of the above categories were listed as miscellaneous and were assigned a growth rate of zero. These sources are vessels, railroads, and residential fuel burning.

Table 12. GROWTH RATES FOR S. CENTRAL AQCR

| Demographic Factor | Growth Rate % per yr. | Source |
|---|---|---|
| Mfg. employees | 0.56 | Wichita-Sedgwick Co. Metro. Plan. Dept., p.13 |
| Population | 1.20 | Wichita-Sedgwick Co. Metro. Plan. Dept., P.13 |
| Generating Capacity | 6.00 | Private communication with Jack E. Alumbaugh, Industrial Development Office, City of Wichita |

Table 13. GROWTH RATES FOR KANSAS CITY AQCR

| Demographic Factor | Growth Rate % per year | Source |
|---|---|---|
| Mfg. employees | 2.60 | Metro. Bul. #3, p.17 |
| Population | 3.00 | Metro. Bul. #3, p. 9 |
| Generating capacity | 8.00 | Private communication with Mr. Terney, Kansas City Board of Public Utilities, Kansas City, Kansas, October 1971 |

## POST-1970 EMISSION CONTROLS

### General

Both Kansas and Missouri forbid open burning under their present regulations. Missouri does not anticipate the adoption of any other regulations (Post-1970) directly affecting Set II pollutants. Kansas has regulations specifically limiting CO, HC, and $NO_x$ emissions pending. These are referred to as Post-1970 Controls. It is estimated that the new regulations would reduce emissions as follows:

| Source | Reduction, % | | |
|---|---|---|---|
| | CO | HC | $NO_x$ |
| Indus. & Comm. fuel burn. | 0 | 0 | 0 |
| Power plants | 0 | 0 | 5 |
| Process losses | 90 | 70 | 0 |
| Solid Waste incin. | 0 | 0 | 0 |
| Gasoline handling | 0 | 0 | 0 |
| Solvents | 0 | 0 | 0 |

A summary of the proposed regulations is attached (Appendix 1).

Regulation 28-19-23 controls HC emissions from fuel tanks greater than 40,000 gal. capacity. It is estimated that 75% are presently uncontrolled (Kansas Statewide Inventory, Sec. 3.3.7). Thus the regulation would reduce emissions by approximately 70%

(.90 X .75). The balance of the regulation controls vapor blowdown and ethylene waste gas streams. These are not significant sources in the two regions. It was therefore determined that an overall process emissions (including gasoline storage) reduction of 70% would be attributable to the regulation.

Regulation 28-19-24 controls CO emissions from foundries and refineries. Afterburners will reduce emissions by 90%. The only other major CO emitting process is carbon black production. Overall, a 90% reduction in process emissions is warranted since there are no carbon black plants in either region.

Regulation 28-19-25 limits emissions from nitric acid plants. There are no nitric acid plants in either region therefore process $NO_x$ emissions are not reduced.

Regulation 28-19-31 limits $NO_x$ emissions from indirect heating units. However the upper limit is as high as uncontrolled emission rates under proper firing conditions and little impact is seen from the regulation. Impact is estimated to be 5% reduction.

## ADJUSTMENT OF APPENDIX I CURVES TO REFLECT LOCAL AUTOMOTIVE GROWTH RATE

### General

Figures 1 through 3, Appendix I, 36 FR 15500, are based on a national average traffic growth rate of 5% per year. The growth rates for Wichita and Kansas City metropolitan areas are 3.1%[a] and 3.8%[b] respectively. The Appendix I curves can be adjusted to reflect this difference in growth rate by multiplying the plotted values by the ratios of the actual growth to the assumed (5%) growth. Thus, using 1967 as the base year, the plotted value for 1975 for Wichita should be multiplied by the fraction $\frac{1 + (8 \times 0.031)}{1 + (8 \times 0.050)}$.

The recalculated emission rates for each region is as follows:

Table 14. RECALCULATED VALUES FOR AUTOMOTIVE EMISSION RATES

| AQCR | YEAR | ANNUAL GROWTH RATE % | POLLUTANT HC | CO | $NO_x$ |
|---|---|---|---|---|---|
| S. CENTRAL (WICHITA) | 1970 | 3.1 | 0.85 | 0.92 | 1.09 |
| | 1975 | 3.1 | 0.49 | 0.63 | 0.96 |
| | 1977 | 3.1 | 0.35 | 0.44 | 0.72 |
| KANSAS CITY | 1970 | 3.8 | 0.88 | 0.95 | 1.12 |
| | 1975 | 3.8 | 0.51 | 0.65 | 1.01 |
| | 1977 | 3.8 | 0.37 | 0.46 | 0.76 |

These adjusted values are shown on Figures 1 through 3.

---

a) Correspondence from E.P. Landman, State Highway Commission of Kansas, dated September 20, 1971.

b) Correspondence from R.P. Turner, U.S. Department of Transportation, dated October 8, 1971.

ADJUSTED NORMALIZED EMISSION RATES FOR
S. CENTRAL AND KANSAS CITY AQCR's

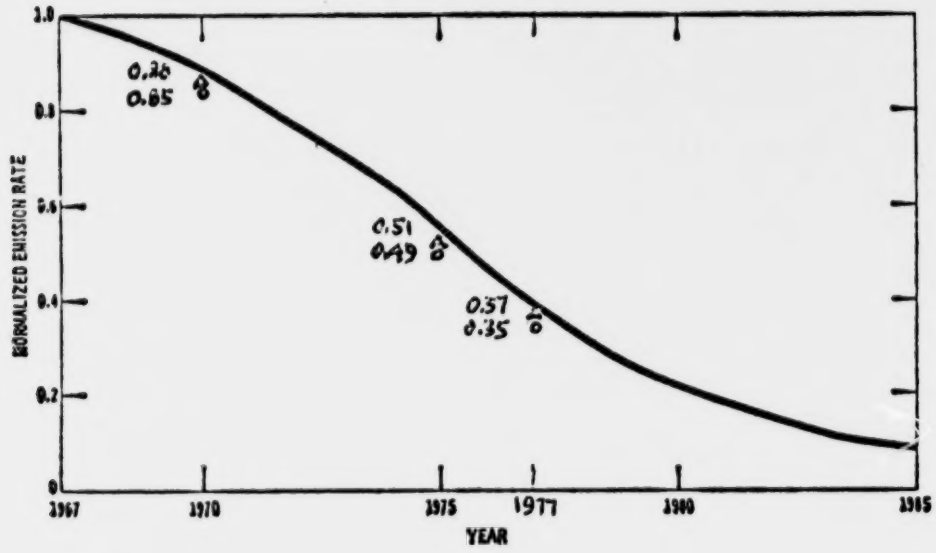



Figure 1. Hydrocarbon emission rates from urban vehicles in United States - projected from 1967 base of 1.

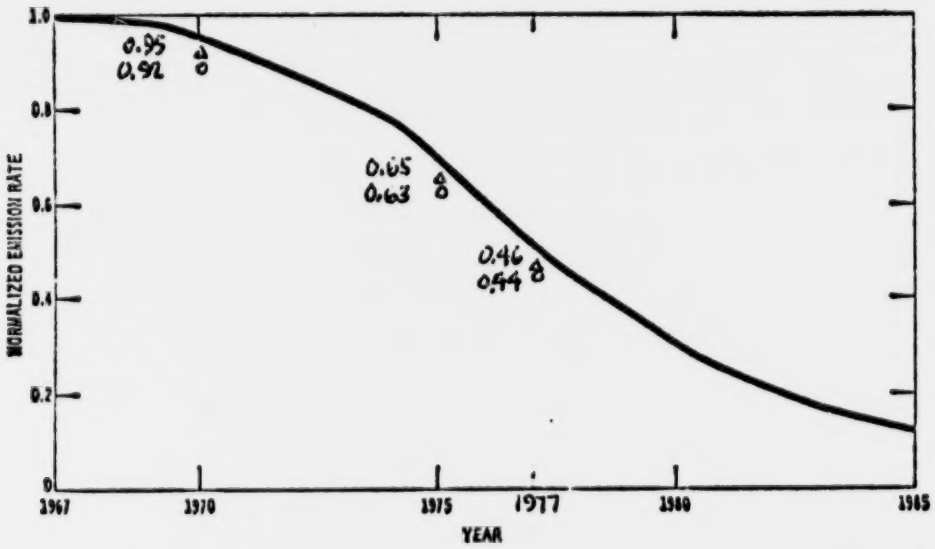
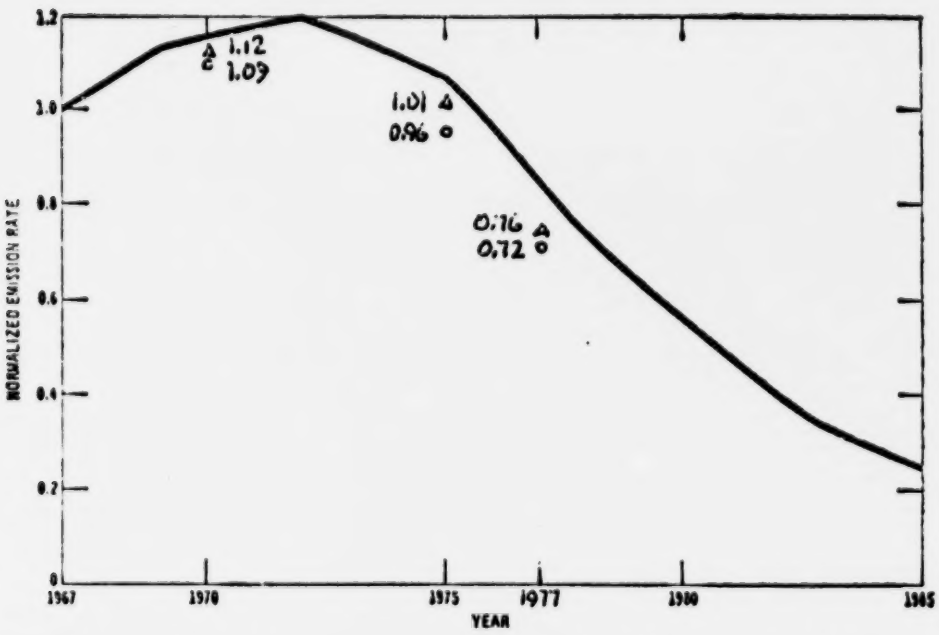



Figure 2. Carbon monoxide emission rates from urban vehicles in United States - projected from 1967 base of 1.




Δ - KANSAS CITY AQCR
O - S. CENTRAL AQCR

Figure 3. Nitrogen oxides emission rates from urban vehicles in United States - projected from 1967 base of 1.

APPENDIX 1

SUMMARY OF PROVISIONS OF PROPOSED AMENDMENTS TO
KANSAS AIR POLLUTION CONTROL REGULATIONS (July 1971)

28-19-1 (Amendment): Intended to define intent of Ambient Air Quality Standards. New definition is consistent with intended application of such standards by the federal government.

28-19-2 (Amendment): Revises definition of Total Suspended Particulate and Sulfur Dioxide and defines additional pollutants.

28-19-3 (Amendment): Changes existing ambient air quality standard for sulfur dioxide and establishes new state standards for carbon monoxide, photo-chemical oxidants, hydrocarbons, and nitrogen dioxide. All proposed standards are the same as nationally applicable federal "secondary" standards which have been promulgated to protect the public welfare from any known or anticipated adverse effects associated with air pollution.

28-19-4 (Amendment): Makes all standards applicable throughout the state.

28-19-6 (Amendment): Revises policy statement regarding emission regulations to encourage application of best control procedures available at any time.

28-19-7 (Amendment): Redefines "alteration" of emission sources to include operational changes, as well as physical changes, to equipment which may substantially increase the amount of emissions.

28-19-8 (Amendment): Lowers level of $SO_2$ and/or $SO_3$ and indirect heating capacity that must be reported and expands list of pollutants which must be reported to include oxides of nitrogen, carbon monoxide, and hydrocarbons.

28-19-11 (Amendment): Provides for temporary excessive emissions which result from malfunctioning of processing equipment, as well as control equipment.

28-19-12 (Amendment): Requires that stack testing be conducted in accordance with federally approved procedures and provides that regular, fixed monitoring may be required for certain sources. This latter provision is required to comply with federal law.

28-19-15 (New): Exempts certain new stationary sources from state control which will be directly subject to federal control.

28-19-22 (New): Establishes limits on sulfur compound emissions from: (1) sulfuric acid plants, (2) non-ferrous smelters, and (3) combustion of process gases (other than for indirect heating, secondary product recovery and control of odors from low BTU streams).

28-19-23 (New): Establishes control requirements concerning sources of hydrocarbon emission including: (1) gasoline and petroleum distillate storage tanks, (2) ethylene production, or utilization, plants, and (3) storage and processing operations which emit more than 50 pounds of hydrocarbons per day.

28-19-24 (New): Establishes control requirements for carbon monoxide emissions from foundries and refineries.

28-19-25 (New): Establishes limits on emissions of oxides of nitrogen from nitric acid plants.

28-19-30 (Amendment): Requires that emissions from indirect heating equipment be tested in accordance with federally approved procedures.

28-19-31 (Amendment): Establishes limits on sulfur dioxide and nitrogen oxide emissions from indirect heating units. The sulfur dioxide restrictions become applicable to systems placed in operation after January 1, 1972, and the nitrogen oxide limits become applicable to units placed under purchase contract after January 1, 1972.

28-19-42 (Amendment): Requires that incinerators be tested in accordance with federally approved procedures.

28-19-55, 28-19-56, 28-19-57, 28-19-58 (New): Provide for an emergency episode plan, as required by federal law. Various "action" levels are established and the development of emergency pollution curtailment plans, by major pollution sources, is required.

APPENDIX 2 - STRATEGY 3
RESULTS OF FED. MOT. VEH. CONTROL
PROGRAM FOR CARBON MONOXIDE POLLUTANT
KANSAS CITY AQCR (KAN. & MO.)
WITH POST-1970 CONTROLS IN KANSAS AND MISSOURI

| SOURCE CATEGORY | Control Factor (a) | Growth % (b) | | Emissions, 1000 TPY (c) | | |
|---|---|---|---|---|---|---|
| | | 1975 | 1977 | 1970 | 1975 | 1977 |
| Indus. and Comm. Fuel | 100 | 113 | 118 | 1.3 | 1.5 | 1.5 |
| Power Plants | 100 | 140 | 156 | 5.3 | 7.4 | 8.3 |
| Process Losses | 10 | 113 | 118 | 8.7 | 0.9 | 0.9 |
| Solid Waste Disposal | 100 | 115 | 121 | 0.9 | 1.0 | 1.1 |
| Other - Open Burning | 0 | 0 | 0 | 14.4 | 0 | 0 |
| Misc. | 100 | 100 | 100 | 17.5 | 17.5 | 17.5 |
| TOTALS → | | | | 48.1 | 28.3 | 29.3 |
| 197N Total / 1970 Total → | | | | | 0.587 | 0.607 |
| | | | | | $GF_{75}$ | $GF_{77}$ |

(a) Percent of emissions after enforcement of post-1970 regulations
(b) Percent of 1970 emissions
(c) Sum of Tables 4-17 & 4-20

FROM APPENDIX I CURVE 2 :

$E_{75} = 0.65$

$E_{77} = 0.46$

$E_{70} = 0.95$

FROM EMISS. INVENTORY:

$$F_{70} = \frac{\text{Motor Veh. Emiss}}{\text{Total Emiss}}$$

$$= \frac{643,100}{691,200} = 0.930$$

---

$$\frac{E_{75}}{E_{70}} (F_{70}) + (1-F_{70})(GF_{75}) = \frac{0.65}{0.95} (0.930) + (1-0.930)\ 0.587$$

$$= 0.636 + 0.041 = 0.67$$

$$\frac{E_{77}}{E_{70}} (F_{70}) + (1-F_{70})(GF_{77}) = \frac{0.46}{0.95} (0.930) + (1-0.930)\ 0.607$$

$$= 0.450 + 0.042 = 0.49$$

## APPENDIX 3

## METHODOLOGY FOR CALCULATION OF EMISSIONS REQUIRED TO MEET THE FEDERAL AIR QUALITY STANDARDS

Emission reductions required to meet the Federal Air Quality Standards were calculated using the proportional model (36 FR 15490) for $NO_x$ and CO while the $O_x$ standard is met based upon HC reductions as set forth in Appendix J (36 FR 15502). The values used for existing air quality were as follows:

| Pollutant | Reading |
|---|---|
| $NO_x$ | Annual arithmetic mean |
| CO | Second highest 8 hr. average |
| $O_x$ | Second highest 1 hr. average |

The rationale for using the second highest reading for CO and $O_x$ is that the Air Quality Standards for these pollutants is based on maximum concentration not to be exceeded more than once per year. Thus the Air Quality Standard is based on the second highest reading and strategies must be calculated accordingly.

The required percentage reduction for $NO_x$ and CO was first calculated by the equation:

$$\frac{A - C}{A - B} \times 100$$

where:

A = Existing air quality at the locating having the highest ($NO_x$) or second highest (CO and $O_x$) measured concentration in the Region.

B = Background concentration (assumed to be zero for all Set II pollutants)

C = National Standard

Oxidant strategies were based on the reduction of hydrocarbons per Fig. 1, Appendix J (36 FR 15502)(Attached Figure 3-1).

Emissions required to achieve the Air Quality Standards were then calculated by multiplying the existing emissions times one minus the percentage reduction required.

Table 3-1 summarizes the reduction calculations.

TABLE 3-1. SUMMARY OF REDUCTION CALCULATIONS FOR SET II POLLUTANTS FOR S. CENTRAL KANSAS AND KANSAS CITY AQCR'S

| | S. Cen. Kan. AQCR | | | Kansas City AQCR | | |
|---|---|---|---|---|---|---|
| | $NO_x$ | CO | $O_x$ | $NO_x$ | CO | $O_x$ |
| Existing air quality | 99 | 5.1 | 190 | 57 | 16.6 | 168 |
| National standard | 100 | 10 | 160 | 100 | 10 | 160 |
| Percent reduction to meet AQS | - | - | 16[b] | - | 39.8 | 3[b] |
| Existing emission, 1000 TPY | 75.3 | 280.4 | 71.3[c] | 306.4 | 689.2 | 186.4[c] |
| Emission required to meet AQS, 1000 TPY | a | a | 59.9 | a | 414 | 181 |

(a) Existing emissions are less than the required amount

(b) See Figure 3-1

(c) Hydrocarbon emissions

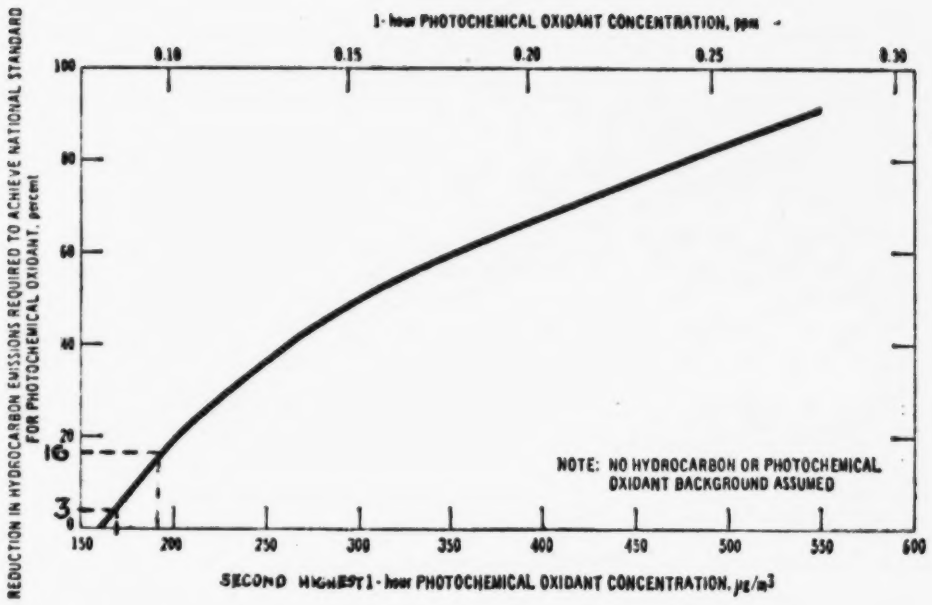



Figure 1. Required hydrocarbon emission control as a function of photochemical oxidant concentration. (Reference: Air Quality Criteria for Nitrogen Oxides, AP-84, Environmental Protection Agency, Washington, D.C., January 1971.)

Figure 3-1 - Appendix J Method for Determining Hydrocarbon Emission Reductions

# APPENDIX 4

## Control Strategy Calculations

## for

## Set II Pollutants

## for

## South Central Kansas AQCR

## and

## Kansas City IAQCR

## Strategies 1 and 2

TABLE 4-1
RESULTS OF FED. MOT. VEH. CONTROL
PROGRAM FOR HYDROCARBONS
S. CENTRAL KAN. (WICHITA) AQCR
WITHOUT POST-1970 CONTROLS

| SOURCE CATEGORY | Control Factor (a) | Growth % (b) | | Emissions, 1000 TPY | | |
|---|---|---|---|---|---|---|
| | | 1975 | 1977 | 1970 | 1975 | 1977 |
| Indus. and Comm. Fuel | 100 | 103 | 104 | 2.0 | 2.1 | 2.1 |
| Power Plants | 100 | 130 | 142 | 1.4 | 1.8 | 2.0 |
| Process Losses | 100 | 103 | 104 | 5.3 | 5.4 | 5.5 |
| Solid Waste Disposal (Incin. | 100 | 106 | 108 | 0.6 | 0.6 | 0.7 |
| Other - Open Burning | 0 | 0 | 0 | 4.2 | 0 | 0 |
| Gasoline Handling | 100 | 103 | 104 | 3.1 | 3.2 | 3.2 |
| Solvents | 100 | 103 | 104 | 4.6 | 4.7 | 4.8 |
| Misc. | 100 | 100 | 100 | 4.7 | 4.7 | 4.7 |
| | | TOTALS → | | 25.9 | 22.5 | 23.0 |
| | | 197N Total / 1970 Total → | | | 0.868 | 0.855 |
| | | | | | $GF_{75}$ | $GF_{77}$ |

(a) Percent of emissions after enforcement of post-1970 regulations

(b) Percent of 1970 emissions

FROM APPENDIX I CURVE 1 :

$E_{75} = 0.49$

$E_{77} = 0.35$

$E_{70} = 0.85$

FROM EMISS. INVENTORY:

$$F_{70} = \frac{\text{Motor Veh. Emiss}}{\text{Total Emiss}}$$

$$= \frac{45,400}{71,300} = 0.64$$

---

$$\frac{E_{75}}{E_{70}} (F_{70}) + (1-F_{70})(GF_{75}) = \frac{0.49}{0.85} (0.64) + (1-0.64)\ 0.868$$

$$= 0.369 + 0.312 = 0.68$$

$$\frac{E_{77}}{E_{70}} (F_{70}) + (1-F_{70})(GF_{77}) = \frac{0.35}{0.85} (0.64) + (1-0.64)\ 0.855$$

$$= 0.264 + 0.308 = 0.57$$

TABLE 4-2

RESULTS OF FED. MOT. VEH. CONTROL PROGRAM FOR CARBON MONOXIDE
S. CENTRAL KAN. (WICHITA) AQCR
WITHOUT POST-1970 CONTROLS

| SOURCE CATEGORY | Control Factor (a) | Growth %[b] | | Emissions, 1000 TPY | | |
|---|---|---|---|---|---|---|
| | | 1975 | 1977 | 1970 | 1975 | 1977 |
| Indus. and Comm. Fuel | 100 | 103 | 104 | 0.5 | 0.5 | 0.5 |
| Power Plants | 100 | 130 | 142 | 0 | 0 | 0 |
| Process Losses | 100 | 103 | 104 | 1.1 | 1.1 | 1.1 |
| Solid Waste Disposal (Incin.) | 100 | 106 | 108 | 2.1 | 2.2 | 2.3 |
| Other - Open Burning | 0 | 0 | 0 | 11.9 | 0 | 0 |
| Agricultural Burn. | 50 | 106 | 108 | 1.5 | 0.8 | 0.8 |
| Misc. | 100 | 100 | 100 | 13.8 | 13.8 | 13.8 |
| | | TOTALS → | | 30.9 | 18.4 | 18.5 |
| | | 197N Total / 1970 Total → | | | 0.596 | 0.598 |
| | | | | | $GF_{75}$ | $GF_{77}$ |

(a) Percent of emissions after enforcement of post-1970 regulations

(b) Percent of 1970 emissions

FROM APPENDIX I CURVE 2 :

$E_{75} = 0.63$

$E_{77} = 0.44$

$E_{70} = 0.92$

FROM EMISS. INVENTORY:

$$F_{70} = \frac{\text{Motor Veh. Emiss}}{\text{Total Emiss}}$$

$$= \frac{249,500}{280,400} = 0.89$$

---

$$\frac{E_{75}}{E_{70}} (F_{70}) + (1-F_{70})(GF_{75}) = \frac{0.63}{0.92} (0.89) + (1-0.89)\ 0.596$$

$$= 0.608 + 0.066 = 0.67$$

$$\frac{E_{77}}{E_{70}} (F_{70}) + (1-F_{70})(GF_{77}) = \frac{0.44}{0.92} (0.89) + (1-0.89)\ 0.598$$

$$= 0.425 + 0.066 = 0.49$$

TABLE 4-3
RESULTS OF FED. MOT. VEH. CONTROL
PROGRAM FOR NITORGEN OXIDES
S. CENTRAL KAN. (WICHITA) AQCR
WITHOUT POST-1970 CONTROLS

| SOURCE CATEGORY | Control Factor (a) | Growth %[b] | | Emissions, 1000 TPY | | |
|---|---|---|---|---|---|---|
| | | 1975 | 1977 | 1970 | 1975 | 1977 |
| Indus. and Comm. Fuel | 100 | 103 | 104 | 10.0 | 10.3 | 10.4 |
| Power Plants | 100 | 130 | 142 | 14.0 | 18.2 | 19.9 |
| Process Losses | 100 | 103 | 104 | 9.1 | 9.4 | 9.5 |
| Solid Waste Disposal(Incin.) | 100 | 106 | 108 | 0.6 | 0.6 | 0.7 |
| Other - Open Burning | 0 | 0 | 0 | 0.9 | 0 | 0 |
| Misc. | 100 | 100 | 100 | 1.9 | 1.9 | 1.9 |
| | | TOTALS → | | 36.5 | 40.4 | 42.4 |
| | | 197N Total / 1970 Total → | | | 1.11 | 1.16 |
| | | | | | $GF_{75}$ | $GF_{77}$ |

(a) Percent of emissions after enforcement of post-1970 regulations

(b) Percent of 1970 emissions

FROM APPENDIX I CURVE 3 :

$E_{75} = 0.96$

$E_{77} = 0.72$

$E_{70} = 1.09$

FROM EMISS. INVENTORY:

$F_{70} = \frac{\text{Motor Veh. Emiss}}{\text{Total Emiss}}$

$= \frac{38,800}{75,300} = 0.52$

---

$$\frac{E_{75}}{E_{70}} (F_{70}) + (1-F_{70})(GF_{75}) = \frac{0.96}{1.09} (0.52) + (1-0.52)\ 1.11$$

$$= 0.456 + 0.532 = 0.99$$

$$\frac{E_{77}}{E_{70}} (F_{70}) + (1-F_{70})(GF_{77}) = \frac{0.72}{1.09} (0.52) + (1-0.52)\ 1.16$$

$$= 0.342 + 0.556 = 0.90$$

TABLE 4-4
RESULTS OF FED. MOT. VEH. CONTROL
PROGRAM FOR HYDROCARBONS
S. CENTRAL KAN. (WICHITA) AQCR
WITH POST-1970 (PROPOSED) CONTROLS

| SOURCE CATEGORY | Control Factor (a) | Growth %[b] 1975 | Growth %[b] 1977 | Emissions, 1000 TPY 1970 | Emissions, 1000 TPY 1975 | Emissions, 1000 TPY 1977 |
|---|---|---|---|---|---|---|
| Indus. and Comm. Fuel | 100 | 103 | 104 | 2.0 | 2.1 | 2.1 |
| Power Plants | 100 | 130 | 142 | 1.4 | 1.8 | 2.0 |
| Process Losses | 30 | 103 | 104 | 5.3 | 1.6 | 1.7 |
| Solid Waste Disposal(Incin.) | 100 | 106 | 108 | 0.6 | 0.6 | 0.7 |
| Other - Open Burning | 0 | 0 | 0 | 4.2 | 0 | 0 |
| Gasoline Handling | 100 | 103 | 104 | 3.1 | 3.2 | 3.2 |
| Solvents | 100 | 103 | 104 | 4.6 | 4.7 | 4.8 |
| Misc. | 100 | 100 | 100 | 4.7 | 4.7 | 4.7 |
| | | TOTALS → | | 25.9 | 18.7 | 19.2 |
| | | 197N Total / 1970 Total → | | | 0.722 | 0.740 |
| | | | | | $GF_{75}$ | $GF_{77}$ |

(a) Percent of emissions after enforcement of post-1970 regulations

(b) Percent of 1970 emissions

FROM APPENDIX I CURVE 1 :

$E_{75} = 0.49$

$E_{77} = 0.35$

$E_{70} = 0.85$

FROM EMISS. INVENTORY:

$$F_{70} = \frac{\text{Motor Veh. Emiss}}{\text{Total Emiss}}$$

$$= \frac{45,400}{71,300} = 0.64$$

---

$$\frac{E_{75}}{E_{70}} (F_{70}) + (1-F_{70})(GF_{75}) = \frac{0.49}{0.85} (0.64) + (1-0.64)\ 0.722$$

$$= 0.369 + 0.260 = 0.60$$

$$\frac{E_{77}}{E_{70}} (F_{70}) + (1-F_{70})(GF_{77}) = \frac{0.35}{0.85} (0.64) + (1-0.64)\ 0.740$$

$$= 0.264 + 0.266 = 0.53$$

TABLE 4-5
RESULTS OF FED. MOT. VEH. CONTROL
PROGRAM FOR CARBON MONOXIDE
S. CENTRAL KAN. (WICHITA) AQCR
WITH POST-1970 (PROPOSED) CONTROLS

| SOURCE CATEGORY | Control Factor (a) | Growth %[b] | | Emissions, 1000 TPY | | |
|---|---|---|---|---|---|---|
| | | 1975 | 1977 | 1970 | 1975 | 1977 |
| Indus. and Comm. Fuel | 100 | 103 | 104 | 0.5 | 0.5 | 0.5 |
| Power Plants | 100 | 130 | 142 | 0 | 0 | 0 |
| Process Losses | 10 | 103 | 104 | 1.1 | 0.1 | 0.1 |
| Solid Waste Disposal(Incin.) | 100 | 106 | 108 | 2.1 | 2.2 | 2.3 |
| Other - Open Burning | 0 | 0 | 0 | 11.9 | 0 | 0 |
| Agricultural Burn. | 50 | 106 | 108 | 1.5 | 0.8 | 0.8 |
| Misc. | 100 | 100 | 100 | 13.8 | 13.8 | 13.8 |
| | | TOTALS → | | 30.9 | 17.4 | 17.5 |
| | | 197N Total / 1970 Total → | | | 0.562 | 0.566 |
| | | | | | $GF_{75}$ | $GF_{77}$ |

(a) Percent of emissions after enforcement of post-1970 regulations

(b) Percent of 1970 emissions

FROM APPENDIX I CURVE 2 :

$E_{75} = 0.63$

$E_{77} = 0.44$

$E_{70} = 0.92$

FROM EMISS. INVENTORY:

$F_{70} = \frac{\text{Motor Veh. Emiss}}{\text{Total Emiss}}$

$= \frac{249,500}{280,400} = 0.89$

---

$$\frac{E_{75}}{E_{70}} (F_{70}) + (1-F_{70})(GF_{75}) = \frac{0.63}{0.92} (0.89) + (1-0.89)\ 0.562$$

$$= 0.608 + 0.062 = 0.67$$

$$\frac{E_{77}}{E_{70}} (F_{70}) + (1-F_{70})(GF_{77}) = \frac{0.44}{0.92} (0.89) + (1-0.89)\ 0.566$$

$$= 0.425 + 0.062 = 0.49$$

TABLE 4-6
RESULTS OF FED. MOT. VEH. CONTROL
PROGRAM FOR NITROGEN OXIDES
S. CENTRAL KAN. (WICHITA) AQCR
WITH POST-1970 (PROPOSED) CONTROLS

| SOURCE CATEGORY | Control Factor (a) | Growth % b | | Emissions, 1000 TPY | | |
|---|---|---|---|---|---|---|
| | | 1975 | 1977 | 1970 | 1975 | 1977 |
| Indus. and Comm. Fuel | 100 | 103 | 104 | 10.0 | 10.3 | 10.4 |
| Power Plants | 95 | 130 | 142 | 14.0 | 17.3 | 18.9 |
| Process Losses | 100 | 103 | 104 | 9.1 | 9.4 | 9.5 |
| Solid Waste Disposal(Incin.) | 100 | 106 | 108 | 0.6 | 0.6 | 0.7 |
| Other - Open Burning | 0 | 0 | 0 | 0.9 | 0 | 0 |
| Misc. | 100 | 100 | 100 | 1.9 | 1.9 | 1.9 |
| | | TOTALS → | | 36.5 | 39.5 | 41.4 |
| | | 197N Total / 1970 Total → | | | 1.08 | 1.13 |
| | | | | | $GF_{75}$ | $GF_{77}$ |

(a) Percent of emissions after enforcement of post-1970 regulations

(b) Percent of 1970 emissions

FROM APPENDIX I CURVE 3 :

$E_{75} = 0.96$

$E_{77} = 0.72$

$E_{70} = 1.09$

FROM EMISS. INVENTORY:

$F_{70} = \frac{\text{Motor Veh. Emiss}}{\text{Total Emiss}}$

$= \frac{38,800}{75,300} = 0.52$

---

$$\frac{E_{75}}{E_{70}} (F_{70}) + (1-F_{70})(GF_{75}) = \frac{0.96}{1.09} (0.52) + (1-0.52)\ 1.08$$

$$= 0.456 + 0.519 = 0.97$$

$$\frac{E_{77}}{E_{70}} (F_{70}) + (1-F_{70})(GF_{77}) = \frac{0.72}{1.09} (0.52) + (1-0.52)\ 1.13$$

$$= 0.342 + 0.544 = 0.89$$

TABLE 4-7
RESULTS OF FED. MOT. VEH. CONTROL
PROGRAM FOR HYDROCARBONS
KANSAS CITY AQCR (KAN. & MO.)
WITHOUT POST-1970 CONTROLS

| SOURCE CATEGORY | Control Factor (a) | Growth [b] % 1975 | Growth [b] % 1977 | Emissions,[c] 1000 TPY 1970 | 1975 | 1977 |
|---|---|---|---|---|---|---|
| Indus. and Comm. Fuel | 100 | 113 | 118 | 11.4 | 12.9 | 13.5 |
| Power Plants | 100 | 140 | 156 | 3.0 | 4.2 | 4.7 |
| Process Losses | 100 | 113 | 118 | 30.2 | 34.1 | 35.6 |
| Solid Waste Disposal | 100 | 115 | 121 | .2 | .2 | .2 |
| Other - Open Burning | 0 | 0 | 0 | 5.7 | 0 | 0 |
| Gasoline Handling | 100 | 113 | 118 | 8.6 | 9.7 | 10.1 |
| Solvents | 100 | 113 | 118 | 5.5 | 6.2 | 6.5 |
| Misc. | 100 | 100 | 100 | 8.7 | 8.7 | 8.7 |
| | | TOTALS → | | 73.3 | 76.0 | 79.3 |
| | | 197N Total / 1970 Total → | | | 1.04 | 1.08 |
| | | | | | $GF_{75}$ | $GF_{77}$ |

(a) Percent of emissions after enforcement of post-1970 regulations

(b) Percent of 1970 emissions

(c) Sum of Tables 4-13 & 4-16

FROM APPENDIX I CURVE 1 :

$E_{75} = 0.51$

$E_{77} = 0.37$

$E_{70} = 0.88$

FROM EMISS. INVENTORY:

$$F_{70} = \frac{\text{Motor Veh. Emiss}}{\text{Total Emiss}}$$

$$= \frac{112,900}{186,200} = 0.606$$

---

$$\frac{E_{75}}{E_{70}} (F_{70}) + (1-F_{70})(GF_{75}) = \frac{0.51}{0.88} (0.606) + (1-0.606)\ 1.04$$

$$= 0.350 + 0.409 = 0.76$$

$$\frac{E_{77}}{E_{70}} (F_{70}) + (1-F_{70})(GF_{77}) = \frac{0.37}{0.88} (0.606) + (1-0.606)\ 1.08$$

$$= 0.254 + 0.426 = 0.68$$

TABLE 4-8
RESULTS OF FED. MOT. VEH. CONTROL
PROGRAM FOR CARBON MONOXIDES
KANSAS CITY AQCR (KAN. & MO.)
WITHOUT POST-1970 CONTROLS

| SOURCE CATEGORY | Control Factor (a) | Growth % (b) | | Emissions (c), 1000 TPY | | |
|---|---|---|---|---|---|---|
| | | 1975 | 1977 | 1970 | 1975 | 1977 |
| Indus. and Comm. Fuel | 100 | 113 | 118 | 1.3 | 1.5 | 1.5 |
| Power Plants | 100 | 140 | 156 | 5.3 | 7.4 | 8.3 |
| Process Losses | 100 | 113 | 118 | 8.7 | 9.9 | 10.2 |
| Solid Waste Disposal | 100 | 115 | 121 | 0.9 | 1.0 | 1.1 |
| Other - Open Burning | 0 | 0 | 0 | 14.4 | 0 | 0 |
| Misc. | 100 | 100 | 100 | 17.5 | 17.5 | 17.5 |
| | | TOTALS → | | 48.1 | 37.3 | 38.6 |
| | | 197N Total / 1970 Total → | | | 0.775 | 0.794 |
| | | | | | $GF_{75}$ | $GF_{77}$ |

(a) Percent of emissions after enforcement of post-1970 regulations

(b) Percent of 1970 emissions

(c) Sum of Tables 4-14 & 4-17

FROM APPENDIX I CURVE 2 :

$E_{75} = 0.65$

$E_{77} = 0.46$

$E_{70} = 0.95$

FROM EMISS. INVENTORY:

$F_{70} = \frac{\text{Motor Veh. Emiss}}{\text{Total Emiss}}$

$= \frac{643,100}{691,200} = 0.930$

---

$$\frac{E_{75}}{E_{70}} (F_{70}) + (1-F_{70})(GF_{75}) = \frac{0.65}{0.95} (0.930) + (1-0.930)\ 0.775$$

$$= 0.636 + 0.054 = 0.69$$

$$\frac{E_{77}}{E_{70}} (F_{70}) + (1-F_{70})(GF_{77}) = \frac{0.46}{0.95} (0.930) + (1-0.930)\ 0.794$$

$$= 0.450 + 0.055 = 0.50$$

TABLE 4-9
RESULTS OF FED. MOT. VEH. CONTROL
PROGRAM FOR NITROGEN OXIDES
KANSAS CITY AQCR (KAN. & MO.)
WITHOUT POST-1970 CONTROLS

| SOURCE CATEGORY | Control Factor (a) | Growth % [b] | | Emissions, [c] 1000 TPY | | |
|---|---|---|---|---|---|---|
| | | 1975 | 1977 | 1970 | 1975 | 1977 |
| Indus. and Comm. Fuel | 100 | 113 | 118 | 128.3 | 145.0 | 151.4 |
| Power Plants | 100 | 140 | 156 | 81.7 | 114.2 | 127.6 |
| Process Losses | 100 | 113 | 118 | 2.6 | 3.0 | 3.1 |
| Solid Waste Disposal | 100 | 115 | 121 | 0.5 | 0.5 | 0.6 |
| Other - Open Burning | 0 | 0 | 0 | 1.0 | 0 | 0 |
| Misc. | 100 | 100 | 100 | 8.5 | 8.5 | 8.5 |
| TOTALS → | | | | 222.6 | 271.2 | 291.2 |
| 197N Total / 1970 Total → | | | | | 1.22 | 1.31 |
| | | | | | $GF_{75}$ | $GF_{77}$ |

(a) Percent of emissions after enforcement of post-1970 regulations

(b) Percent of 1970 emissions

(c) Sum of Tables 4-15 & 4-18

FROM APPENDIX I CURVE 3 :

$E_{75}$ = 1.01

$E_{77}$ = 0.76

$E_{70}$ = 1.12

FROM EMISS. INVENTORY:

$$F_{70} = \frac{\text{Motor Veh. Emiss}}{\text{Total Emiss}}$$

$$= \frac{83,700}{306,300} = 0.273$$

---

$$\frac{E_{75}}{E_{70}} (F_{70}) + (1-F_{70})(GF_{75}) = \frac{1.01}{1.12} (0.273) + (1-0.273)\ 1.22$$

$$= 0.246 + 0.887 = 1.13$$

$$\frac{E_{77}}{E_{70}} (F_{70}) + (1-F_{70})(GF_{77}) = \frac{0.76}{1.12} (0.273) + (1-0.273)\ 1.31$$

$$= 0.185 + 0.952 = 1.14$$

TABLE 4-10
RESULTS OF FED. MOT. VEH. CONTROL
PROGRAM FOR HYDROCARBONS
KANSAS CITY AQCR (KAN. & MO.)
WITH POST-1970 CONTROLS

| SOURCE CATEGORY | Control Factor (a) | Growth % [b] 1975 | Growth % [b] 1977 | Emissions, [c] 1000 TPY 1970 | 1975 | 1977 |
|---|---|---|---|---|---|---|
| Indus. and Comm. Fuel | | | | 11.4 | 12.9 | 13.5 |
| Power Plants | | | | 3.0 | 4.2 | 4.7 |
| Process Losses | | | | 30.2 | 28.8 | 30.1 |
| Solid Waste Disposal | | | | .2 | .2 | .2 |
| Other - Open Burning | | | | 5.7 | 0 | 0 |
| Gasoline Handling | | | | 8.6 | 9.7 | 10.1 |
| Solvents | | | | 5.5 | 6.2 | 6.5 |
| Misc. | | | | 8.7 | 8.7 | 8.7 |
| | | TOTALS → | | 73.3 | 70.7 | 73.8 |
| | | 197N Total / 1970 Total → | | | 0.964 | 1.01 |
| | | | | | $GF_{75}$ | $GF_{77}$ |

(a) Percent of emissions after enforcement of post-1970 regulations

(b) Percent of 1970 emissions

(c) Sum of Tables 4-16 & 4-19

FROM APPENDIX I CURVE 1 :

$E_{75} = 0.51$

$E_{77} = 0.37$

$E_{70} = 0.88$

FROM EMISS. INVENTORY:

$$F_{70} = \frac{\text{Motor Veh. Emiss}}{\text{Total Emiss}}$$

$$= \frac{112,900}{186,200} = 0.606$$

---

$$\frac{E_{75}}{E_{70}} (F_{70}) + (1-F_{70})(GF_{75}) = \frac{0.51}{0.88} (0.606) + (1-0.606)\ 0.964$$

$$= 0.350 + 0.380 = 0.73$$

$$\frac{E_{77}}{E_{70}} (F_{70}) + (1-F_{70})(GF_{77}) = \frac{0.37}{0.88} (0.606) + (1-0.606)\ 1.01$$

$$= 0.254 + 0.398 + 0.65$$

TABLE 4-11
RESULTS OF FED. MOT. VEH. CONTROL
PROGRAM FOR CARBON MONOXIDE
KANSAS CITY AQCR (KAN. & MO.)
WITH POST-1970 CONTROLS

| SOURCE CATEGORY | Control Factor (a) | Growth %[b] 1975 | Growth %[b] 1977 | Emissions,[c] 1000 TPY 1970 | 1975 | 1977 |
|---|---|---|---|---|---|---|
| Indus. and Comm. Fuel | | | | 1.3 | 1.5 | 1.5 |
| Power Plants | | | | 5.3 | 7.4 | 8.3 |
| Process Losses | | | | 8.7 | 8.6 | 8.9 |
| Solid Waste Disposal | | | | 0.9 | 1.0 | 1.1 |
| Other - Open Burning | | | | 14.4 | 0 | 0 |
| Misc. | | | | 17.5 | 17.5 | 17.5 |
| | | TOTALS → | | 48.1 | 36.0 | 37.2 |
| | | 197N Total / 1970 Total → | | | 0.748 | 0.773 |
| | | | | | $GF_{75}$ | $GF_{77}$ |

(a) Percent of emissions after enforcement of post-1970 regulations

(b) Percent of 1970 emissions

(c) Sum of Tables 4-17 & 4-20

FROM APPENDIX I CURVE 2 :

$E_{75} = 0.65$

$E_{77} = 0.46$

$E_{70} = 0.95$

FROM EMISS. INVENTORY:

$$F_{70} = \frac{\text{Motor Veh. Emiss}}{\text{Total Emiss}}$$

$$= \frac{643,100}{691,200} = 0.930$$

---

$$\frac{E_{75}}{E_{70}} (F_{70}) + (1-F_{70})(GF_{75}) = \frac{0.65}{0.95} (0.930) + (1-0.930) \quad 0.748$$

$$= 0.636 + 0.052 = 0.69$$

$$\frac{E_{77}}{E_{70}} (F_{70}) + (1-F_{70})(GF_{77}) = \frac{0.46}{0.95} (0.930) + (1-0.930) \quad 0.773$$

$$= 0.450 + 0.054 = 0.50$$

TABLE 4-12
RESULTS OF FED. MOT. VEH. CONTROL
PROGRAM FOR NITROGEN OXIDES
KANSAS CITY AQCR (KAN. & MO.)
WITH POST-1970 CONTROLS

| SOURCE CATEGORY | Control Factor (a) | Growth % [b] | | Emissions, [c] 1000 TPY | | |
|---|---|---|---|---|---|---|
| | | 1975 | 1977 | 1970 | 1975 | 1977 |
| Indus. and Comm. Fuel | | | | 128.3 | 145.0 | 151.4 |
| Power Plants | | | | 81.7 | 113.6 | 126.9 |
| Process Losses | | | | 2.6 | 3.0 | 3.1 |
| Solid Waste Disposal | | | | 0.5 | 0.5 | 0.6 |
| Other - Open Burning | | | | 1.0 | 0 | 0 |
| Misc. | | | | 8.5 | 8.5 | 8.5 |
| | | TOTALS → | | 222.6 | 270.6 | 290.5 |
| | | 197N Total / 1970 Total → | | | 1.22 | 1.30 |
| | | | | | $GF_{75}$ | $GF_{77}$ |

(a) Percent of emissions after enforcement of post-1970 regulations

(b) Percent of 1970 emissions

(c) Sum of Table 4-18 & 4-21

FROM APPENDIX I CURVE 3 :

$E_{75} = 1.01$

$E_{77} = 0.76$

$E_{70} = 1.12$

FROM EMISS. INVENTORY:

$$F_{70} = \frac{\text{Motor Veh. Emiss}}{\text{Total Emiss}}$$

$$= \frac{83,700}{306,300} = 0.273$$

---

$$\frac{E_{75}}{E_{70}} (F_{70}) + (1-F_{70})(GF_{75}) = \frac{1.01}{1.12} (0.273) + (1-0.273)\ 1.22$$

$$= 0.246 + 0.887 = 1.13$$

$$\frac{E_{77}}{E_{70}} (F_{70}) + (1-F_{70})(GF_{77}) = \frac{0.76}{1.12} (0.273) + (1-0.273)\ 1.30$$

$$= 0.185 + 0.945 = 1.13$$

TABLE 4-13
RESULTS OF FED. MOT. VEH. CONTROL
PROGRAM FOR HYDROCARBONS
KANSAS CITY AQCR
KANSAS PORTION
WITHOUT POST-1970 CONTROLS

| SOURCE CATEGORY | Control Factor (a) | Growth % (b) | | Emissions, 1000 TPY | | |
|---|---|---|---|---|---|---|
| | | 1975 | 1977 | 1970 | 1975 | 1977 |
| Indus. and Comm. Fuel | 100 | 113 | 118 | 0.6 | 0.7 | 0.7 |
| Power Plants | 100 | 140 | 156 | 0.6 | 0.8 | 0.9 |
| Process Losses | 100 | 113 | 118 | 6.6 | 7.5 | 7.8 |
| Solid Waste Disposal | 100 | 115 | 121 | 0.2 | 0.2 | 0.2 |
| Other - Open Burning | 0 | 0 | 0 | 1.9 | 0 | 0 |
| Gasoling Handling | 100 | 113 | 118 | 3.0 | 3.4 | 3.5 |
| Solvents | 100 | 113 | 118 | 4.4 | 5.0 | 5.2 |
| Misc. | 100 | 100 | 100 | 4.7 | 4.7 | 4.7 |
| | | TOTALS → | | 22.0 | 22.3 | 23.0 |
| | | 197N Total / 1970 Total → | | | 1.01 | 1.04 |
| | | | | | $GF_{75}$ | $GF_{77}$ |

(a) Percent of emissions after enforcement of post-1970 regulations

(b) Percent of 1970 emissions

FROM APPENDIX I CURVE 1 :

$E_{75} = 0.51$

$E_{77} = 0.37$

$E_{70} = 0.88$

FROM EMISS. INVENTORY:

$$F_{70} = \frac{\text{Motor Veh. Emiss}}{\text{Total Emiss}}$$

$$= \frac{33{,}000}{55{,}000} = 0.600$$

---

$$\frac{E_{75}}{E_{70}} (F_{70}) + (1-F_{70})(GF_{75}) = \frac{0.51}{0.88} (0.600) + (1-0.600)\ 1.01$$

$$= 0.348 + 0.404 = 0.75$$

$$\frac{E_{77}}{E_{70}} (F_{70}) + (1-F_{70})(GF_{77}) = \frac{0.37}{0.88} (0.600) + (1-0.600)\ 1.04$$

$$= 0.252 + 0.416 = 0.67$$

TABLE 4-14

RESULTS OF FED. MOT. VEH. CONTROL
PROGRAM FOR CARBON MONOXIDE
KANSAS CITY AQCR
KANSAS PORTION
WITHOUT POST-1970 CONTROLS

| SOURCE CATEGORY | Control Factor (a) | Growth % 1975 | Growth % 1977 | Emissions, 1000 TPY 1970 | Emissions, 1000 TPY 1975 | Emissions, 1000 TPY 1977 |
|---|---|---|---|---|---|---|
| Indus. and Comm. Fuel | 100 | 113 | 118 | 0.8 | 0.9 | 0.9 |
| Power Plants | 100 | 140 | 156 | 0.1 | 0.1 | 0.2 |
| Process Losses | 100 | 113 | 118 | 1.3 | 1.5 | 1.5 |
| Solid Waste Disposal | 100 | 115 | 121 | 0.9 | 1.0 | 1.1 |
| Other - Open Burning | 0 | 0 | 0 | 3.4 | 0 | 0 |
| Misc. | 100 | 100 | 100 | 12.9 | 12.9 | 12.9 |
| | | TOTALS → | | 19.4 | 16.4 | 16.6 |
| | | 197N Total / 1970 Total → | | | 0.845 | 0.855 |
| | | | | | $GF_{75}$ | $GF_{77}$ |

(a) Percent of emissions after enforcement of post-1970 regulations

(b) Percent of 1970 emissions

FROM APPENDIX I CURVE 2 :

$E_{75} = 0.65$

$E_{77} = 0.46$

$E_{70} = 0.95$

FROM EMISS. INVENTORY:

$$F_{70} = \frac{\text{Motor Veh. Emiss}}{\text{Total Emiss}}$$

$$= \frac{184,200}{203,600} = 0.905$$

---

$$\frac{E_{75}}{E_{70}} (F_{70}) + (1-F_{70})(GF_{75}) = \frac{0.65}{0.95} (0.905) + (1-0.905)\ 0.845$$

$$= 0.618 + 0.080 = 0.70$$

$$\frac{E_{77}}{E_{70}} (F_{70}) + (1-F_{70})(GF_{77}) = \frac{0.46}{0.95} (0.905) + (1-0.905)\ 0.855$$

$$= 0.437 + 0.081 = 0.52$$

TABLE 4-15
RESULTS OF FED. MOT. VEH. CONTROL
PROGRAM FOR NITROGEN OXIDES
KANSAS CITY AQCR
KANSAS PORTION
WITHOUT POST-1970 CONTROLS

| SOURCE CATEGORY | Control Factor (a) | Growth % (b) 1975 | Growth % (b) 1977 | Emissions, 1000 TPY 1970 | Emissions, 1000 TPY 1975 | Emissions, 1000 TPY 1977 |
|---|---|---|---|---|---|---|
| Indus. and Comm. Fuel | 100 | 113 | 118 | 3.1 | 3.5 | 3.7 |
| Power Plants | 100 | 140 | 156 | 8.7 | 12.2 | 13.6 |
| Process Losses | 100 | 113 | 118 | 1.2 | 1.4 | 1.4 |
| Solid Waste Disposal | 100 | 115 | 121 | 0.3 | 0.3 | 0.4 |
| Other - Open Burning | 0 | 0 | 0 | 0.2 | 0 | 0 |
| Misc. | 100 | 100 | 100 | 5.2 | 5.2 | 5.2 |
| | | TOTALS → | | 18.7 | 22.6 | 24.3 |
| | | 197N Total / 1970 Total → | | | 1.21 | 1.30 |
| | | | | | $GF_{75}$ | $GF_{77}$ |

(a) Percent of emissions after enforcement of post-1970 regulations

(b) Percent of 1970 emissions

FROM APPENDIX I CURVE 3 :

$E_{75} = 1.01$

$E_{77} = 0.76$

$E_{70} = 1.12$

FROM EMISS. INVENTORY:

$F_{70} = \frac{\text{Motor Veh. Emiss}}{\text{Total Emiss}}$

$= \frac{25,800}{44,500} = 0.579$

---

$$\frac{E_{75}}{E_{70}} (F_{70}) + (1-F_{70})(GF_{75}) = \frac{1.01}{1.12} (0.579) + (1-0.579)\ 1.21$$

$$= 0.521 + 0.510 = 1.03$$

$$\frac{E_{77}}{E_{70}} (F_{70}) + (1-F_{70})(GF_{77}) = \frac{0.76}{1.12} (0.579) + (1-0.579)\ 1.30$$

$$= 0.392 + 0.548 = 0.94$$

TABLE 4-16
RESULTS OF FED. MOT. VEH. CONTROL
PROGRAM FOR HYDROCARBONS
KANSAS CITY AQCR
MISSOURI PORTION
WITHOUT POST-1970 CONTROLS

| SOURCE CATEGORY | Control Factor (a) | Growth % [b] | | Emissions, 1000 TPY | | |
|---|---|---|---|---|---|---|
| | | 1975 | 1977 | 1970 | 1975 | 1977 |
| Indus. and Comm. Fuel | 100 | 113 | 118 | 10.8 | 12.2 | 12.8 |
| Power Plants | 100 | 140 | 156 | 2.4 | 3.4 | 3.8 |
| Process Losses | 100 | 113 | 118 | 23.6 | 26.6 | 27.8 |
| Solid Waste Disposal | 100 | 115 | 121 | 0 | 0 | 0 |
| Other - Open Burning | 0 | 0 | 0 | 3.8 | 0 | 0 |
| Misc. | 100 | 100 | 100 | 4.0 | 4.0 | 4.0 |
| Solvents | 100 | 113 | 118 | 1.1 | 1.2 | 1.3 |
| Gasoline Handling | 100 | 113 | 118 | 5.6 | 6.3 | 6.6 |
| | | TOTALS → | | 51.3 | 53.7 | 56.3 |
| | | 197N Total / 1970 Total → | | | 1.05 | 1.08 |
| | | | | | $GF_{75}$ | $GF_{77}$ |

(a) Percent of emissions after enforcement of post-1970 regulations

(b) Percent of 1970 emissions

FROM APPENDIX I CURVE 1 :

$E_{75} = 0.51$

$E_{77} = 0.37$

$E_{70} = 0.88$

FROM EMISS. INVENTORY:

$F_{70} = \frac{\text{Motor Veh. Emiss}}{\text{Total Emiss}}$

$= \frac{79,000}{131,200} = 0.609$

---

$$\frac{E_{75}}{E_{70}} (F_{70}) + (1-F_{70})(GF_{75}) = \frac{0.51}{0.88} (0.609) + (1-0.609)\ 1.05$$

$$= 0.352 + 0.412 = 0.76$$

$$\frac{E_{77}}{E_{70}} (F_{70}) + (1-F_{70})(GF_{77}) = \frac{0.37}{0.88} (0.609) + (1-0.609)\ 1.08$$

$$= 0.256 + 0.423 = 0.68$$

TABLE 4-17
RESULTS OF FED. MOT. VEH. CONTROL
PROGRAM FOR CARBON MONOXIDES
KANSAS CITY AQCR
MISSOURI PORTION
WITHOUT POST-1970 CONTROLS

| SOURCE CATEGORY | Control Factor (a) | Growth % (b) 1975 | Growth % (b) 1977 | Emissions, 1000 TPY 1970 | Emissions, 1000 TPY 1975 | Emissions, 1000 TPY 1977 |
|---|---|---|---|---|---|---|
| Indus. and Comm. Fuel | 100 | 113 | 118 | 0.5 | 0.6 | 0.6 |
| Power Plants | 100 | 140 | 156 | 5.2 | 7.3 | 8.1 |
| Process Losses | 100 | 113 | 118 | 7.4 | 8.4 | 8.7 |
| Solid Waste Disposal(Incin.) | 100 | 115 | 121 | 0 | 0 | 0 |
| Other - Open Burning | 0 | 0 | 0 | 11.0 | 0 | 0 |
| Misc. | 100 | 100 | 100 | 4.6 | 4.6 | 4.6 |
| | | TOTALS → | | 28.7 | 20.9 | 22.0 |
| | | 197N Total / 1970 Total → | | | 0.728 | 0.767 |
| | | | | | $GF_{75}$ | $GF_{77}$ |

(a) Percent of emissions after enforcement of post-1970 regulations

(b) Percent of 1970 emissions

FROM APPENDIX I CURVE 2 :

$E_{75} = 0.65$

$E_{77} = 0.46$

$E_{70} = 0.95$

FROM EMISS. INVENTORY:

$$F_{70} = \frac{\text{Motor Veh. Emiss}}{\text{Total Emiss}}$$

$$= \frac{458,900}{487,600} = 0.941$$

---

$$\frac{E_{75}}{E_{70}} (F_{70}) + (1-F_{70})(GF_{75}) = \frac{0.65}{0.95} (0.941) + (1-0.941)\ 0.728$$

$$= 0.645 + 0.057 = 0.70$$

$$\frac{E_{77}}{E_{70}} (F_{70}) + (1-F_{70})(GF_{77}) = \frac{0.46}{0.95} (0.941) + (1-0.941)\ 0.767$$

$$= 0.454 + 0.060 = 0.51$$

TABLE 4-18
RESULTS OF FED. MOT. VEH. CONTROL
PROGRAM FOR NITROGEN OXIDES
KANSAS CITY AQCR
MISSOURI PORTION
WITHOUT POST-1970 CONTROLS

| SOURCE CATEGORY | Control Factor (a) | Growth % (b) | | Emissions, 1000 TPY | | |
|---|---|---|---|---|---|---|
| | | 1975 | 1977 | 1970 | 1975 | 1977 |
| Indus. and Comm. Fuel | 100 | 113 | 118 | 125.2 | 141.5 | 147.7 |
| Power Plants | 100 | 140 | 156 | 73.0 | 102.0 | 114.0 |
| Process Losses | 100 | 113 | 118 | 1.4 | 1.6 | 1.7 |
| Solid Waste Disposal | 100 | 115 | 121 | 0.2 | 0.2 | 0.2 |
| Other - Open Burning | 0 | 0 | 0 | 0.8 | 0 | 0 |
| Mics. | 100 | 100 | 100 | 3.3 | 3.3 | 3.3 |
| TOTALS → | | | | 203.9 | 248.6 | 266.9 |
| 197N Total / 1970 Total → | | | | | 1.22 | 1.31 |
| | | | | | $GF_{75}$ | $GF_{77}$ |

(a) Percent of emissions after enforcement of post-1970 regulations

(b) Percent of 1970 emissions

FROM APPENDIX I CURVE 3 :

$E_{75} = 1.01$

$E_{77} = 0.76$

$E_{70} = 1.12$

FROM EMISS. INVENTORY:

$$F_{70} = \frac{\text{Motor Veh. Emiss}}{\text{Total Emiss}}$$

$$= \frac{57,900}{261,800} = 0.221$$

---

$$\frac{E_{75}}{E_{70}} (F_{70}) + (1-F_{70})(GF_{75}) = \frac{1.01}{1.12} (0.221) + (1-0.211)\ 1.22$$

$$= 0.199 + 0.950 = 1.15$$

$$\frac{E_{77}}{E_{70}} (F_{70}) + (1-F_{70})(GF_{77}) = \frac{0.70}{1.12} (0.221) + (1-0.211)\ 1.31$$

$$= 0.138 + 1.02 = 1.16$$

TABLE 4-19
RESULTS OF FED. MOT. VEH. CONTROL
PROGRAM FOR HYDROCARBONS
KANSAS CITY AQCR
KANSAS PORTION
WITH POST-1970 CONTROLS

| SOURCE CATEGORY | Control Factor (a) | Growth % (b) 1975 | Growth % (b) 1977 | Emissions, 1000 TPY 1970 | Emissions, 1000 TPY 1975 | Emissions, 1000 TPY 1977 |
|---|---|---|---|---|---|---|
| Indus. and Comm. Fuel | 100 | 113 | 118 | 0.6 | 0.7 | 0.7 |
| Power Plants | 100 | 140 | 156 | 0.6 | 0.8 | 0.9 |
| Process Losses | 30 | 113 | 118 | 6.6 | 2.2 | 2.3 |
| Solid Waste Disposal(Incin.) | 100 | 115 | 121 | 0.2 | 0.2 | 0.2 |
| Other - Open Burning | 0 | 0 | 0 | 1.9 | 0 | 0 |
| Gasoline Handling | 100 | 113 | 118 | 3.0 | 3.4 | 3.5 |
| Solvents | 100 | 113 | 118 | 4.4 | 5.0 | 5.2 |
| Misc. | 100 | 100 | 110 | 4.7 | 4.7 | 4.7 |
| | | TOTALS → | | 22.0 | 17.0 | 17.5 |
| | | 197N Total / 1970 Total → | | | 0.773 | 0.795 |
| | | | | | $GF_{75}$ | $GF_{77}$ |

(a) Percent of emissions after enforcement of post-1970 regulations

(b) Percent of 1970 emissions

FROM APPENDIX I CURVE 1 :

$E_{75} = 0.51$

$E_{77} = 0.37$

$E_{70} = 0.88$

FROM EMISS. INVENTORY:

$$F_{70} = \frac{\text{Motor Veh. Emiss}}{\text{Total Emiss}}$$

$$= \frac{33{,}000}{55{,}000} = 0.600$$

---

$$\frac{E_{75}}{E_{70}} \quad (F_{70}) + (1-F_{70})(GF_{75}) = \frac{0.51}{0.88} (0.600) + (1-0.600)\ 0.773$$

$$= 0.348 + 0.310 = 0.66$$

$$\frac{E_{77}}{E_{70}} \quad (F_{70}) + (1-F_{70})(GF_{77}) = \frac{0.37}{0.88} (0.600) + (1-0.600)\ 0.795$$

$$= 0.252 + 0.318 = 0.57$$

TABLE 4-20
RESULTS OF FED. MOT. VEH. CONTROL
PROGRAM FOR CARBON MONOXIDE
KANSAS CITY AQCR
KANSAS PORTION
WITH POST-1970 CONTROLS

| SOURCE CATEGORY | Control Factor (a) | Growth % [b] | | Emissions, 1000 TPY | | |
|---|---|---|---|---|---|---|
| | | 1975 | 1977 | 1970 | 1975 | 1977 |
| Indus. and Comm. Fuel | 100 | 113 | 118 | 0.8 | 0.9 | 0.9 |
| Power Plants | 100 | 140 | 156 | 0.1 | 0.1 | 0.2 |
| Process Losses | 10 | 113 | 118 | 1.3 | 0.2 | 0.2 |
| Solid Waste Disposal | 100 | 115 | 121 | 0.9 | 1.0 | 1.1 |
| Other - Open Burning | 0 | 0 | 0 | 3.4 | 0 | 0 |
| Misc. | 100 | 100 | 100 | 12.9 | 12.9 | 12.9 |
| | | TOTALS → | | 19.4 | 15.1 | 15.3 |
| | | 197N Total / 1970 Total → | | | 0.778 | 0.788 |
| | | | | | $GF_{75}$ | $GF_{77}$ |

(a) Percent of emissions after enforcement of post-1970 regulations

(b) Percent of 1970 emissions

FROM APPENDIX I CURVE 2 :

$E_{75} = 0.65$

$E_{77} = 0.46$

$E_{70} = 0.95$

FROM EMISS. INVENTORY:

$$F_{70} = \frac{\text{Motor Veh. Emiss}}{\text{Total Emiss}}$$

$$= \frac{184,200}{203,600} = 0.905$$

---

$$\frac{E_{75}}{E_{70}} (F_{70}) + (1-F_{70})(GF_{75}) = \frac{0.65}{0.95} (0.905) + (1-0.905)\ 0.778$$

$$= 0.618 + 0.074 = 0.69$$

$$\frac{E_{77}}{E_{70}} (F_{70}) + (1-F_{70})(GF_{77}) = \frac{0.46}{0.95} (0.905) + (1-0.905)\ 0.788$$

$$= 0.437 + 0.075 = 0.51$$

TABLE 4-21
RESULTS OF FED. MOT. VEH. CONTROL
PROGRAM FOR NITROGEN OXIDES
KANSAS CITY AQCR
KANSAS PORTION
WITH POST-1970 CONTROLS

| SOURCE CATEGORY | Control Factor (a) | Growth % 1975 | Growth % 1977 | Emissions, 1000 TPY 1970 | Emissions, 1000 TPY 1975 | Emissions, 1000 TPY 1977 |
|---|---|---|---|---|---|---|
| Indus. and Comm. Fuel | 100 | 113 | 118 | 3.1 | 3.5 | 3.7 |
| Power Plants | 95 | 140 | 156 | 8.7 | 11.6 | 12.9 |
| Process Losses | 100 | 113 | 118 | 1.2 | 1.4 | 1.4 |
| Solid Waste Disposal | 100 | 115 | 121 | 0.3 | 0.3 | 0.4 |
| Other - Open Burning | 0 | 0 | 0 | 0.2 | 0 | 0 |
| Misc. | 100 | 100 | 100 | 5.2 | 5.2 | 5.2 |
| | | TOTALS → | | 18.7 | 22.0 | 23.6 |
| | | 197N Total / 1970 Total → | | | 1.18 | 1.26 |
| | | | | | $GF_{75}$ | $GF_{77}$ |

(a) Percent of emissions after enforcement of post-1970 regulations

(b) Percent of 1970 emissions

FROM APPENDIX I CURVE 3 :

$E_{75} = 1.01$

$E_{77} = 0.76$

$E_{70} = 1.12$

FROM EMISS. INVENTORY:

$F_{70} = \frac{\text{Motor Veh. Emiss}}{\text{Total Emiss}}$

$= \frac{25,800}{44,500} = 0.578$

---

$$\frac{E_{75}}{E_{70}} (F_{70}) + (1-F_{70})(GF_{75}) = \frac{1.01}{1.12} (0.578) + (1-0.578)\ 1.18$$

$$= 0.521 + 0.498 = 1.02$$

$$\frac{E_{77}}{E_{70}} (F_{70}) + (1-F_{70})(GF_{77}) = \frac{0.76}{1.12} (0.578) + (1-0.578)\ 1.26$$

$$= 0.392 + 0.532 = 0.92$$